

New taxa in the *Leucopogon gracilis* group (Ericaceae: Styphelioideae: Styphelieae)

Michael Hislop

Western Australian Herbarium, Department of Environment and Conservation,
Locked Bag 104, Bentley Delivery Centre, Western Australia 6983

Abstract

Hislop, M. New taxa in the *Leucopogon gracilis* group (Ericaceae: Styphelioideae: Styphelieae). *Nuytsia* 19(2): 211–228 (2009). Three new taxa, *Leucopogon paradoxus* Hislop, *L. tenuicaulis* Hislop and *L. elegans* Sond. subsp. *psorophyllus* are described. The first two of these are illustrated and the distributions of all three are mapped. A key is provided for all Western Australian taxa currently referred to the informal, subgeneric *Leucopogon gracilis* Group (*sensu* Hislop & Chapman 2007). Lectotypes are designated for the following taxa: *Leucopogon elegans* Sond., *L. gracilis* R.Br., *L. oppositifolius* Sond. and *L. oppositifolius* var. *pubescens* Sond.

Introduction

With only five published species, the *Leucopogon gracilis* group (Group E) is the smallest of the recently delineated (Hislop & Chapman 2007), informal, subgeneric groups within Western Australian *Leucopogon s. str.* All five species were named in the nineteenth century prior to the publication of Bentham's *Flora Australiensis* (1868). Brown (1810) described the first of these, *Leucopogon gracilis* R.Br., followed by two from Sonder (1845), *L. elegans* Sond. and *L. oppositifolius* Sond., with the Russian taxonomist Serge Stschegleew adding the other two, *L. gnaphalioides* Stschegl. and *L. lasiophyllus* Stschegl., in 1859. Bentham placed *L. oppositifolius* in series *Oppositifoliae*, and the rest in series *Concurvae*, despite noting the obvious similarities between *L. oppositifolius* and *L. lasiophyllus*.

The two new species from the group described in this paper have been recognised informally for a number of years and were treated in *Flora of the South West* (Wheeler *et al.* 2002). *Leucopogon paradoxus* Hislop was known by the name *Leucopogon* sp. Windy Harbour (A. Strid 21460), a phrase-name installed by Wheeler. *Leucopogon tenuicaulis* J.M.Powell ex Hislop was recognised under the same epithet, but as a Powell manuscript name. The third taxon, *Leucopogon elegans* Sond. subsp. *psorophyllus* Hislop, has been hitherto unrecognised.

Methods

This study was based on an examination of dried specimens housed at PERTH. The details of the methods used to measure plant parts and make other morphological observations are the same as those described previously (Hislop 2009), except in relation to the measurement of the inflorescence axis. The members of the *Leucopogon australis* group, described in earlier papers, have their upper

leaves and lower fertile bracts clearly dimorphic which allows the lower extremity of the inflorescence to be fixed at its insertion point in a leaf axil (where it is subtended by sterile bracts). Elsewhere in *Leucopogon s. str.* however, including the *Leucopogon gracilis* group, there is usually a gradual upward transition, at least on the main axes, from the lowest bracts which are indistinguishable from the upper leaves, to the upper bracts which are significantly different in shape and texture. For species with this inflorescence type the basal point of the inflorescence is taken to be the lowest fertile axil.

The distribution map was compiled using DIVA-GIS Version 5.2.0.2 and based on PERTH specimen data

A synopsis of and key to the *Leucopogon gracilis* group in Western Australia

Rootstock fire-sensitive; leaves spirally arranged or opposite, antrorse, usually steeply so; upper leaves and lower fertile bracts dimorphic or not; inner surface of corolla tube with 5 longitudinal inter-staminal bands of hair extending from the base of the corolla lobes to a point \pm level with the anther bases (in *L. paradoxus* the hairs are reflexed into the tube from a narrow, apical ring); abaxial surface of corolla lobes glabrous; ovary variously hairy (except in *L. gnaphalioides* where it is glabrous), 2-locular; nectary annular, lobed; drupes compressed, ellipsoid, narrowly ellipsoid, ovate or narrowly ovate, with 2 median longitudinal grooves, transversely elliptic in section, mesocarp very thin or apparently absent, the apex a fleshy appendage in all species except *L. paradoxus*, in which the apex is subacute with the appendage lacking; endocarp crustaceous.

1. Leaves always spirally arranged
2. Sepals to 1.2 mm long; corolla lobes to 1.2 mm long, corolla tube always manifestly longer than sepals; style 0.3–0.5 mm long, slender, deciduous in fruit; ovary hairs very short, restricted to two median longitudinal bands in the lower half (swamps between Witchcliffe, Augusta & Denmark) **L. paradoxus**
- 2: Sepals at least 1.2 (usually > 1.5) mm long; corolla lobes >1.4 mm long, corolla tube length variable, relative to sepal length; style to 0.3 mm long, thick, persistent in fruit, although wholly or partially obscured by a terminal, rugose appendage; ovary hairs, if present, rather long and evenly distributed, at least in the lower half
3. Unit inflorescences aggregated into a dense terminal conflorescence; bracteoles 1.8–2.4 mm long; ovary glabrous (peaks of the Stirling Range) **L. gnaphalioides**
- 3: Unit inflorescences not significantly aggregated, well differentiated from each other; bracteoles 0.8–2.0 mm long; ovary hairy, at least in lower half
4. Leaves sparsely arranged, 1–3 nodes per 1 cm of branchlet length (as measured immediately below the lowest inflorescence); inflorescences 11–28-flowered; flowers distinctly pedicellate, especially those in the lower half of the inflorescence; corolla lobe hairs 0.5–0.8 mm long (swamps from the Scott River Plain to the Whicher Range) **L. tenuicaulis**
- 4: Leaves not sparsely arranged, 3–8 or more nodes per 1 cm of branchlet length; inflorescence 4–12-flowered; flowers sessile throughout inflorescence; corolla lobe hairs 1 mm or longer
5. Leaves usually glabrous, but if hairy then without long marginal cilia, very narrowly ovate or very narrowly elliptic, length to width ratio 5.4–12.2: 1, widest leaves <1.5 mm wide, usually < 1.2 mm, petiole rather obscure, to c. 0.7 mm long (Denmark to just east of Albany) **L. gracilis**

- 5: Leaves usually variously hairy, occasionally glabrous, often with long marginal cilia, narrowly ovate to ovate, length to width ratio 2.2–4.5 : 1, widest leaves > 1.8 mm wide, usually > 2 mm, petiole broad and conspicuous, reddish or orange-yellow, variable in length but at least with some > 1 mm long
6. Adaxial leaf surface shortly and densely hairy, abaxial leaf surface often hairy; sepals 2.9–3.8 mm long, often hairy on abaxial surface; bracteoles 1.3–2.0 mm long (Wellstead to Cape Riche to the Pallinup River) **L. elegans** subsp. **psorophyllus**
- 6: Adaxial leaf surface glabrous or very sparsely hairy towards the base, abaxial leaf surface glabrous; sepals 2.1–3.0 mm long, glabrous on abaxial surface; bracteoles 0.9–1.4 mm long (southern Stirling Range to Two People Bay to Cheyne Beach) **L. elegans** subsp. **elegans**
- 1: All or at least some leaves opposite or sub-opposite
7. Abaxial leaf surfaces glabrous, or if rarely sparsely hairy, then the hairs not tubercle-based, the surface always smooth; calyx 2.1–3.0 mm long (Cranbrook to SW of Mt. Barker to Manypeaks, including the Stirling Range, also at Cape Arid National Park) **L. oppositifolius**
- 7: Abaxial leaf surfaces with stiff, patent, tubercle-based hairs, these often abraded on older leaves, the surface remaining verrucose, although otherwise glabrous; calyx 2.9–4.5 mm long (Stirling Range) **L. lasiophyllus**

Notes on the morphology and distribution of the *Leucopogon gracilis* group

The fruiting characters which in large part define the *Leucopogon gracilis* group are remarkably different from those of the four other infrageneric groups recognised by Hislop and Chapman (2007). In place of the tough, woody, fruiting endocarp which is otherwise typical of all western species of *Leucopogon s. str.*, members of the *L. gracilis* group have an endocarp which is thin and crustaceous, such that it may be readily breached by a thumb nail at maturity. Among western Styphelieae generally, a comparably brittle endocarp is otherwise seen only in a small, well-defined group of species related to *Leucopogon flavescens* Sond. in *Leucopogon s. lat.* In respect to other aspects of fruiting morphology however, the flattened drupes of the latter group are very different.

The development of a rugose, fleshy appendage at the drupe apex is also restricted to the *L. gracilis* group. In flower the ovary apex is demarcated from the usually short, thick style by the presence of a well-defined flange. As the drupe develops, fleshy tissue (presumably homologous to the mesocarp in a typical epacrid drupe) is produced vertically from about the flange to enclose the style base. At maturity this tissue may form a rim, above which only the stigma is visible (in *L. tenuicaulis*) or completely envelop the style and stigma (the remaining species). *Leucopogon paradoxus* lacks this apical appendage and has other morphological features which are anomalous within the group and even within the genus as a whole (as discussed below in the Notes section under that species). The presence of a well-defined stipe between the receptacle and the base of the mature drupe is another remarkable feature of the group.

In addition to these fruiting synapomorphies, members of the *L. gracilis* group also share an uncommon floral character. With the exception again of *L. paradoxus*, all species have more or less discrete, longitudinal bands of hair which extend from the base of the corolla lobes well into the tube. While species from other infraspecific groups may sometimes appear to be hairy in this region, closer

examination reveals that such hairs are reflexed into the tube either from the basal portion of the lobes or from a narrow ring of hairs at the tube apex.

The eight taxa which comprise the *L. gracilis* group are mainly distributed in near-coastal parts of the far south-west corner of Western Australia from the Whicher Range to the Pallinup River, west of Bremer Bay, and then with a disjunct occurrence well to the east at Cape Arid National Park. The furthest inland a member species (*L. oppositifolius*) has been recorded is from Hamilla Hill, north of the Stirling Range, about 100 kilometres from the south coast.

Taxonomy

Leucopogon elegans Sond. in C. Lehmann, *Pl. Preiss.* 1: 318 (1845). *Styphelia blepharophylla* F. Muell., *Fragm.* 6: 34 (1867). *Type*: In glareosis sterilibus collium Konkoberup, promontorii Cape Riche [near Cape Riche, Western Australia], 20 November 1840, *L. Preiss* 378 (*lecto*, here designated: MEL 76539!; *isolecto*: MEL 76540!).

Low, spreading *shrubs* to 50 cm high and 50 cm wide, although usually smaller, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* pale brown or reddish-brown, glabrous or with a sparse to dense indumentum of patent, straight or somewhat decurved hairs, usually of mixed lengths, to 0.6 mm long, which may persist in patches on the older stems. *Leaves* spirally arranged, steeply antrorse, narrowly ovate to ovate, 3.4–7.5(–9.8) mm long, 1.5–3.1 mm wide; apex acute; base cuneate or less often rounded; petiole broad, well defined, yellowish or orange-red, 0.5–1.6 mm long, glabrous throughout or sparsely to densely hairy on both surfaces; lamina 0.15–0.25 mm thick, strongly concave adaxially, longitudinal axis incurved, especially immediately above the petiole and towards the apex; surfaces discolorous, adaxial surface matt, pale green or glaucous, either entirely glabrous or with a few scattered hairs and 3–5 distinct, flat veins evident or else densely hairy throughout with a short, white, patent indumentum often obscuring the venation, abaxial surface darker, shiny, glabrous to moderately hairy, with 5–7 flat or slightly sunken veins, the midrib no more prominent than the others; the margins glabrous or ciliate with prominent hairs to *c.* 1.2 mm long. *Inflorescence* erect, terminal and upper-axillary; axis sometimes markedly flexuose, 3–11 mm long, with 4–11 flowers, terminating in an attenuate point or a bud-like rudiment; glabrous or with an indumentum of sparse to dense, patent hairs to *c.* 0.2 mm long, flowers erect and sessile. *Fertile bracts* narrowly ovate to ovate, varying significantly in size within each inflorescence, the lowest ones, at least on the primary axes, leaf-like (to *c.* 6 mm long and 2 mm wide), differing from the upper leaves in having longer petioles, above which the lamina is more abruptly incurved, diminishing in size through successive nodes, usually with only the uppermost small and typically ‘bract-like’ (the latter 0.8–1.4 mm long and 0.6–0.8 mm wide), sometimes all bracts leaf-like or in the case of the short upper-axillary inflorescences all may be small and ‘bract-like’. *Bracteoles* ovate or narrowly ovate, 0.9–2.0 mm long, 0.5–1.0 mm wide, obtuse, subacute or acute, keeled, although sometimes rather obscurely; abaxial surface glabrous throughout or with a moderately dense indumentum of patent to shallowly antrorse hairs, usually greenish, sometimes suffused pink in the central portion, narrowly scarious towards the margins; adaxial surface glabrous throughout or sparsely antrorse-hairy; margins ciliolate although sometimes minutely so. *Sepals* narrowly ovate to narrowly elliptic, 2.1–3.5 mm long, 0.7–1.0 mm wide, acute or subacute; abaxial surface glabrous or with a sparse to moderately dense indumentum of patent to shallowly antrorse hairs, either greenish throughout the central portion or with the pale venation conspicuous and alternating with broader, green, interveinal bands, the whole sometimes suffused reddish in the upper half, narrowly scarious towards the margins; adaxial surface sparsely antrorse-hairy; the margins varying from minutely and sparsely to densely ciliolate and then with hairs

to c. 0.2 mm long. *Corolla tube* white or pink, narrowly campanulate, slightly shorter than to slightly longer than the sepals, 1.9–2.3 mm long, 0.8–1.2 mm wide, glabrous externally, internal surface with 5 longitudinal bands of hair extending from the base of the lobes to a point \pm level with or a little below the anther bases. *Corolla lobes* white or pink, usually longer than the tube, less often about the same length or slightly shorter (ratio = 0.9–1.5: 1), widely spreading from the base and recurved, 2.1–3.0 mm long, 0.5–0.8 mm wide at base; glabrous externally, densely bearded internally, indumentum white, 1.0–1.4 mm long near apex; the glabrous tip very short c. 0.1 mm long. *Anthers* partially exerted from tube (by 1/8–1/4 of length), 1.4–2.2 mm long, prominently recurved at apex; sterile tips very long, 0.9–1.5 mm with conspicuous white apices. *Filaments* terete, attached 2/3–3/4 above anther base, very short, 0.1–0.2 mm long, adnate to tube just below sinus. *Ovary* slightly compressed, ovoid, 0.5–0.7 mm long, 0.4–0.5 mm wide with a moderately dense indumentum of appressed antrorse hairs in basal half, c. 0.2 mm long, 2-locular. *Style* 0.15–0.30 mm long, thick, papillose, included within the corolla tube; *stigma* slightly to distinctly expanded; *nectary* annular, 0.3–0.5 mm long, enveloping the lower 1/2–2/3 of the ovary, lobed for up to 1/2 of its length, the rim jagged and minutely ciliate, otherwise glabrous. *Fruit* stipitate, compressed, narrowly ellipsoid, 2.4–3.0 mm long (including the stipe), 0.8–1.1 mm wide, longer than the calyx, the apex a fleshy rim produced vertically so as to completely obscure the style, sparsely hairy in the lower half, the surface smooth with a shallow, median, longitudinal groove; style persistent.

Notes. *Leucopogon elegans* is a variable species especially in regard to the presence, distribution and density of an indumentum on its vegetative parts. Two apparently parapatric subspecies are recognised based on bracteole and sepal length together with indumentum differences.

a. *Leucopogon elegans* Sond. subsp. *elegans*

Leucopogon elegans var. *glaucifolius* Sond. in C. Lehmann, *Pl. Preiss.* 1: 318 (1845). *Type:* Ad portum Regis Georgii, *L. Preiss s.n. (holo: ?MEL, n.v.)*.

Illustration. Blackall & Grieve (1981: 329).

Leaves entirely glabrous, or the margins ciliate and either both surfaces glabrous, or the lower adaxial surface with a few hairs in the lower half. *Bracteoles* 0.9–1.4 mm long, obtuse to subacute, glabrous on the abaxial surface. *Sepals* 2.1–3.0 mm long, glabrous on the abaxial surface.

Selected specimens examined. WESTERN AUSTRALIA: 11 km E of Mt. Manypeaks, 20 Jan. 1997, *R. Davis* 2111 (PERTH); Moates Lake Reserve [N of Two Peoples Bay], 25 June 1990, *R. Fairman* 82 (PERTH); 20 miles [c. 32 km] NE of Albany on Hassell Hwy [South Coast Highway], 29 Mar. 1964, *A.S. George* 6163 (CANB, NSW, PERTH); Cheyne Beach [SE of Manypeaks], 28 May 1964, *A.S. George* 6288 (CANB, PERTH); 5 1/2 miles [c. 8.8 km] E of Manypeaks, 10 Dec. 1964, *A.S. George* 6489 (NSW, PERTH); 17 miles [c. 27.2 km] E of Albany on road to Mt. Gardner, 8 Mar. 1967, *A.S. George* 8650 (NSW, PERTH); Takalarup Rd, c. 1.5 km E of Albany – Chester Pass Rd, E of Porongurup, 28 Sep. 1977, *A.S. George* 14943 (NSW, PERTH); Palmdale Rd, 9 km WNW of Manypeaks, 10 Nov. 1982, *G.J. Keighery* 5889 (CANB, PERTH); Herring Bay, Betty's Bay [Beach], 35 km E of Albany, 7 Aug. 1986, *G.J. Keighery* 8252 (CANB, PERTH); access track to Granite Hill Nature Reserve, 1.7 km E of Moorilup Rd, E of Porongurup, 16 Nov. 2003, *M. Hislop* 3094 (CANB, NSW, PERTH); close to corner of Bettys Beach Rd and East Bay Rd, N of Two Peoples Bay, 14 Feb. 2004, *M. Hislop* 3163 (PERTH); Waychinicup National Park, c. 1 km SW of Cheyne Beach settlement, 27 Aug. 2006, *M. Hislop* 3640 (CANB, PERTH); Channel Point [mainland adjacent to], Bald Island, 25 Oct 1971,

N.G. Marchant 71/720 (PERTH); 4 miles [c. 6.4 km] S of Mt. Toolbrunup [Stirling Range National Park], 30 Dec. 1962, *K.R. Newbey* 685 (PERTH); dune below granite rocks, above Cheyne Beach, 22 Aug. 1979, *J.M. Powell* 1294 (CANB, K, L, MO, NSW, PERTH, RSA); Two Peoples Bay Rd, 7 km E of Albany – Nanarup Rd junction, 29 Aug. 1986, *J.M. Powell* 2709 (HO, K, NSW, PERTH); 4 miles [c. 6.4 km] E of Kalgan River [NE of Albany], 30 July 1953, *R.D. Royce* 4268 (PERTH); Pfeiffer Rd [N of Manypeaks], 2 Sep. 1965, *E. Wittwer* 510 (PERTH).

Distribution and habitat. Occurs sporadically from the southern Stirling Range southwards to Two Peoples Bay and is then locally common from there eastwards to the Cheyne Beach area (Figure 1). Grows in sandy soils in both dry and winter-wet heath and low woodland.

Phenology. Appears to flower intermittently throughout the year, and presumably fruit is also likely to be present in most months of the year.

Conservation status. Apparently well-conserved in a number of National Parks and Nature Reserves, where it is often locally common. No conservation coding is recommended at this stage.

Notes. As delineated here this taxon includes two more or less recognisable variants. The less common of these has vegetative parts that are glabrous, or almost so, and occurs in a restricted area mostly around Two Peoples Bay, in the south-western portion of the species' range. Type material of var. *glaucifolius* Sond. has not yet been located by the author, but it seems clear from Sonder's description that the name applies to this glabrous variant. There are, however, no co-relating floral or fruiting differences to support its taxonomic recognition and in any case a couple of collections (e.g. *E.J. Hickman* 6) do have a very sparse indumentum on the stems and leaf margins and so appear intermediate between the variants.

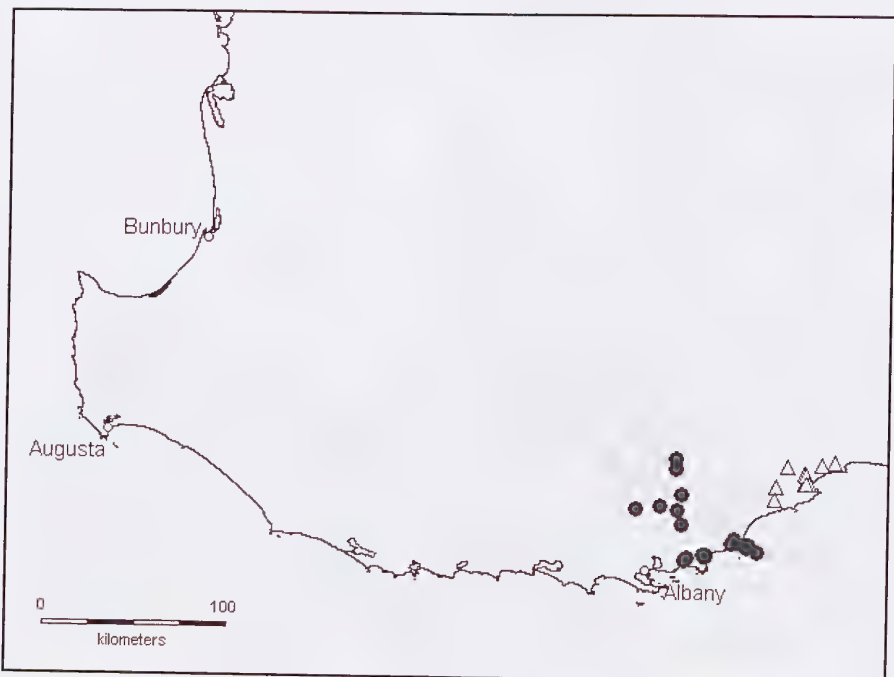


Figure 1. Distribution of *Leucopogon elegans* subsp. *elegans* (●) and *L. elegans* subsp. *psorophyllus* (△) in south-west Western Australia.

The type variant which occurs across the rest of the subspecies' range is characterized by the presence of an indumentum, at least on the inflorescence axes and usually on the stems, and in having long-ciliate leaf margins with or without a few hairs on the lower half of the adaxial surface.

Two collections (*R.D. Royce* 4268 & *E. Wittwer* 510) have longer than normal leaves (to 10 mm) and are also notable in being the only specimens with long, spreading hairs on the abaxial leaf surfaces. It seems probable that these were collected from juvenile plants. The Royce collection comprises four individual specimens, three of which have the leaf characteristics described above. In the case of the fourth specimen however, while the lower leaves are the same as the others on the sheet, the upper are shorter, glabrous on their abaxial surface and generally quite typical for subsp. *elegans*.

b. *Leucopogon elegans* Sond. subsp. *psorophyllus* Hislop subsp. nov.

A subspecie typico bracteolis et sepalis longioribus, pagina adaxiali foliorum pilosa differt.

Typus: West of Bremer Bay [precise locality withheld for conservation reasons], Western Australia, 2 October. 1974, *K.R. Newbey* 4464 (*holo:* PERTH 03132455; *iso:* AD, CANB, K).

Leaves ciliate or not, the adaxial surface with a moderately dense to dense indumentum of short, patent hairs throughout, the abaxial surface either with a sparse to moderately dense indumentum of patent hairs or glabrous. *Bracteoles* 1.3–2.0 mm long, subacute to acute, hairy or glabrous on the abaxial surface. *Sepals* 2.9–3.8 mm long, hairy or glabrous on the abaxial surface.

Specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 3–6 Mar. 1964, *W.H. Butler s.n.* (PERTH); 18 Mar. 1997, *R. Davis* 2893 (PERTH); 20 Oct. 1991, *W. Greuter* 23024 (PERTH); 7 June 2009, *M. Hislop* 3881 (PERTH); 7 June 2009, *M. Hislop* 3883 (CANB, NSW, PERTH); 26 May 1983, *G.J. Keighery* 6045 (CANB, PERTH); 24 Oct. 1996, *J.W. Mercer* 57 (PERTH); 1 Dec. 1974, *K.R. Newbey* 4634 (PERTH); 11 Nov. 1987, *K.R. Newbey* 11812 (PERTH); 16 Nov. 1985, *J.M. Powell* 3274 (HO, NSW, PERTH); 9 May 2003, *E.M. Sandiford* EMS 723 (PERTH); 9 May 2003, *E.M. Sandiford* EMS 735 (PERTH).

Distribution and habitat. Currently known to occur from a little west of Wellstead to Cape Riche to the Pallinup River (Figure 1). Grows in sandy soils, sometimes over laterite or spongolite, in heath or mallee woodland.

Phenology. The specimens examined were all collected between October and June, but given that the typical subspecies flowers throughout the year, it would not be surprising if some flowering also occurred in winter and/or early spring.

Etymology. From the Greek *psoro* (rough) and *phyllon* (leaf), a reference to the short, coarse indumentum which is always present on the upper and often also on the lower leaf surface.

Conservation status. DEC Conservation Codes for Western Australian Flora: Priority Three. This taxon appears to be very restricted geographically. It is known to occur in Mettler Lake Nature Reserve and the large Crown Reserve that extends between Cape Riche and Groper Bluff.

Notes. Although the type collections of *Leucopogon elegans* are certainly of the widespread variant of subsp. *elegans* discussed above, the locality given by Preiss (i.e. close to Cape Riche) is disjunct

for that taxon, but is within the distribution of subsp. *psorophyllus*. This anomaly may be the result of inaccurate record-keeping by Preiss, but if further collecting is able to demonstrate that the two taxa are indeed sympatric in the Cape Riche area, then it may be more appropriate to recognise the new taxon as a separate species.

Within *Leucopogon s. str.* (and elsewhere in the tribe Stypheliae) potential differences between taxa in terms of their vegetative indumentum, have to be treated with considerable circumspection. Many species are known to be very variable in this regard, and it is not uncommon to see mixed populations of conspicuously hairy and more or less glabrous individuals, with or without obvious intermediates. Nevertheless there is considerable evidence to suggest that the presence of a moderately dense to dense indumentum of short, antrorse or patent hairs on the adaxial leaf surface (of the kind seen in subsp. *psorophyllus*), is likely to be a reliable morphological character. It is for instance, always present in *Leucopogon oppositifolius* Sond., the most widespread species in Group E, as well as its close relative *L. lasiophyllus* Stschegl. In Group C it is a confirmatory character for *L. ozothamnoides* Benth. and at least one other unnamed taxon [i.e. *L. sp.* Burma Road (M. Hislop 2032)]. Away from *Leucopogon s. str.* it is consistently present in the widespread taxon *Leucopogon tamminensis* E. Pritz. var. *australis* E. Pritz., a member of the western 'Gynoconus' group of species (sensu Powell *et al.* 1997) in *Leucopogon s. lat.*

Leucopogon gracilis R.Br., *Prod. Fl. Nov. Holl.* 544 (1810). *Styphelia gracilis* (R.Br.) Spreng., *Syst. Veg.* 1: 658 (1824). *Type*: King George Sound [Western Australia], 11 December 1801–5 January 1802, *R. Brown s.n.* (*lecto*, here designated: BM 000929084!; *isolecto*: BM 000929086!).

Selected specimens examined. WESTERN AUSTRALIA: Ledge Beach Rd, Lower Kalgan, 9 Sep. 1983, *E.J. Croxford* 2666 (PERTH); Hooper Rd, 1 km from Lower King Rd, NE of Albany, 15 Dec. 1998, *E.J. Croxford* 8121 (PERTH); Denbarker State Forest, 'the Sand Track', 4.8 km W from Denbarker–Mount Barker Rd towards Stans Rd, 3 Sep. 1994, *B.G. Hammersley* 1124 (PERTH); Mt. Martin Botanical Park, off Spike Daniels track, NW of Dick Renshaw lookout [E of Albany], 20 Apr. 2003, *M. Hislop* 2940 (PERTH); Bakers Junction, 11 km NE of Albany, 10 July 1986, *G.J. Keighery* 8142 (PERTH); Gull Rock Rd, 4 km N of Gull Rock, E of Albany, 15 Aug. 1986, *G.J. Keighery* 8315 (PERTH); Millbrook Rd, 6 km ESE of junction with Albany Highway [N of Albany], 21 Aug. 1979, *J.M. Powell* 1279 (CANB, K, L, MO, NSW, PERTH, RSA); Granite Rd, 3 km N of Break Rd junction, c. 17 km NW of Denmark, 1 Feb. 1980, *J.M. Powell* 1433 (CANB, K, L, MEL, NSW, PERTH); Mt. Lindesay, track to summit area, NNW of Denmark, 3 Feb. 1980, *J.M. Powell* 1441 (K, MEL, NSW, PERTH).

Distribution and habitat. *Leucopogon gracilis* apparently has a disjunct distribution, with one node around Albany and another north of Denmark. It grows in sandy soils, often over granite, as a component of dry or winter-wet open woodland or heath.

Conservation status. Both of the population nodes are quite localized. Individual populations around Albany are likely to be threatened by the continued spread in that area of the root-rot pathogen, *Phytophthora cinnamomi* Rands., to which many epacrids are known to be susceptible (Keighery 1996), as well as ongoing urban development.

Notes. The Albany populations of the species, to which the type belongs, are invariably glabrous, while those from north of Denmark are either glabrous or more frequently with a sparse or moderately dense indumentum of patent hairs on the branchlets, inflorescence axes and abaxial leaf surfaces.

Leucopogon oppositifolius Sond. in C. Lehmann, *Pl. Preiss.* 1: 316 (1845). *Styphelia oppositifolia* (Sond.) F.Muell., *Fragm.* 6: 34 (1867). *Type*: Ad sinum Regis Georgii, Dec. 1840 et in Australia occidentali, *L. Preiss* 380 et 400 (*lecto*, here designated, *L. Preiss* 400: MEL 78367!). *Paralecto*: *L. Preiss* 380 (MEL 78366!).

Leucopogon oppositifolius var. *pubescens* Sond. [published as β *pubescens*] in C. Lehmann, *Pl. Preiss.* 1: 316 (1845). *Type*: In regionibus interioribus Australiae merid.-occid. m. Nov. 1840 [interior of south-western Australia, November 1840], *L. Preiss s.n.* (*lecto* here designated: MEL 78368!).

Selected specimens examined. WESTERN AUSTRALIA: S of Toolbrunup road, base of long ridge, SSE of Mt. Toolbrunup, 13 Oct. 2005, *S. Barrett* 1438 (PERTH); 10.8 km W of Chester Pass Rd on internal firebreak [Stirling Range National Park], 27 Mar. 2006, *S. Barrett* 1439 (PERTH); c. 1 km SW of Little Monderup [Stirling Range National Park], 16 June 2006, *S. Barrett* 1488 (PERTH); Mount Arid Rd, 3.6 km S of intersection with Merivale Rd (E side of road), 20 Oct. 1997, *E.A. Brown* 97/351, *P.G. Wilson & N. Lam* (CHR, NSW, NY, PERTH, UNSW); 2.2 km W of the Seal Creek camping area on the entrance road, Condingup [Cape Arid National Park], 7 Apr. 2007, *G. Byrne* 2615 (PERTH); Sheepwash State Forest on N boundary, 2 km E from Denmark–Mount Barker Rd, 14 Aug. 1993, *B.G. Hammersley* 898 (PERTH); W side of Surrey Downs Rd c. 1 km N of Mount Barker–Porongurup Rd, locality of Porongurup, 29 Dec. 2001, *M. Hislop* 2521 (NSW, PERTH); Hamilla Hill Nature Reserve, S boundary c. 2.5 km from SE corner, 30 Dec. 2001, *M. Hislop* 2531 (PERTH); Sukeys Peak [Sukey Hill], 8 km E of Cranbrook, 19 Aug. 1986, *G.J. Keighery & J. Alford s.n.* (PERTH); 0.2 km W of Chester Pass Rd on Stirling Range Drive, Stirling Range National Park, 19 Aug. 1979, *J.M. Powell* 1258 (CANB, K, L, MEL, NSW, PERTH); 11 km SW of Bluff Knoll turnoff, 2 km SW of Tolls Peak Rd on Chester Pass Rd, Stirling Range National Park, 19 Aug. 1979, *J.M. Powell* 1229 (CANB, K, L, MEL, NSW, PERTH); 3 km W of Mount Barker on Denmark road, 22 Sep. 1982, *A. Strid* 20387 (PERTH).

Distribution and habitat. This species has a remarkably disjunct distribution, with the main centre of occurrence from Cranbrook to just south of the Porongurup Range (there is an old record from Albany), and from the Denbarker area in the west to Two Peoples Bay. Over 400 kilometres to the east there is a second population node in the Cape Arid National Park. Grows in sand or sandy loam soils, sometimes over laterite or quartzite, in heath or open mallee woodland.

Conservation status. The western populations are conserved in the Stirling Range National Park, where it is still locally common, and in several other nature reserves. Its susceptibility to *Phytophthora cinnamomi* Rands is unknown, but if vulnerable, it is likely to suffer significant future decline in the Stirling Ranges where the root-rot pathogen now affects much of the park. Although the eastern population node is apparently quite localized, it occurs in remote country in the Cape Arid National Park and appears relatively secure.

Lectotypification. Of the two syntypes represented in Sonder's personal herbarium now at MEL, *Preiss* 400 is selected in preference to 380 because it is a single, good-sized specimen whereas the latter consists of four, smaller pieces. The locality information on both sheets is exactly the same as that given in the protologue, so there is some doubt as to which number is associated with which of the two cited (albeit vague) localities.

Affinities. Although he included *Leucopogon lasiophyllus* Stschegl. in his treatment of the genus, Bentham (1868) expressed doubts as to whether it was distinct from *L. oppositifolius*. He made the

comment that it only appeared to differ 'in the rather longer, more pubescent leaves, mostly alternate'. This view was apparently shared by Blackall and Grieve (1981) who also separated the two exclusively by foliar characters. With the benefit of the many additional collections that have been made in recent decades, together with field observations made by the author and Albany based Department of Environment and Conservation flora officer, Sarah Barrett (pers. comm.), there is now a stronger morphological and ecological basis for the continued recognition of two species. The combined sepal and leaf characters used in the above key will separate the two unequivocally in most cases. The very few specimens (e.g. A. Worz 04.11.01.07) that appear intermediate may be the result of limited introgression where the two species are growing in close proximity. Both species are locally common in the Stirling Range (*L. lasiophyllus* is endemic to the range) but generally occupy different habitats. *Leucopogon lasiophyllus* occurs high in the landscape, growing on mountain slopes in sandy loam or loam over quartzite or sandstone. *Leucopogon oppositifolius* on the other hand is usually found on the flats in deeper sand or sandy loam soils, although north of the Stirling Range at Hamilla and Sukey Hills it is known to grow in shallow soil over quartzite.

While the abaxial leaf surface in *L. oppositifolius* is consistently glabrous across most of the species' range, in populations around Mount Barker they are generally hairy. These plants look similar to *L. lasiophyllus* but the hairs are softer and not tubercle-based and the sepals are typical of *L. oppositifolius*. The morphology of the type of *L. oppositifolius* var. *pubescens* is very close to this variant of the species.

Notes. Given the exceptional geographical disjunction between the western and eastern populations of the species, it could be expected that some divergence would be evident. However there is little in the morphology to reflect this, other than a weak tendency towards smaller leaves in the eastern plants.

Leucopogon paradoxus* Hislop, *sp. nov.

Leucopogi gracili affinis sed sepalis brevioribus, tubo corollae longitudine sepala semper multo superans, stylo longiore angustiore, et pilis ovarii brevioribus ad lineam verticalem basin versus restrictis differt.

Typus: Denmark Shire, Watershed Rd, 0.5 km N from Break Rd [NW of Denmark], Western Australia, 24 October 1998, B.G. Hammersley 2069 (*holo:* PERTH 05333032; *iso:* CANB, NSW).

Leucopogon sp. Windy Harbour (A. Strid 21460), in G. Paczkowska & A.R. Chapman, *West. Austral. Fl.: Descr. Cat.* p. 240 (2000); in J. Wheeler, N. Marchant, & M. Lewington, *Fl. South West* 2: 599 (2002).

Erect, delicate *shrubs* to c. 50 cm high and 30 cm wide, but usually smaller, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* very slender, pale brown or yellowish-brown, glabrous, becoming overlain, though often rather sparingly, on older stems with grey, fissured bark, which sometimes exfoliates in fine hair-like strips. *Leaves* spirally arranged, steeply antrorse or antrorse-appressed and often \pm stem-clasping, very narrowly ovate or very narrowly elliptic, 3.8–13.8 mm long, 0.5–1.4 mm wide; apex acuminate without callus tip; base attenuate or cuneate; petiole glabrous, usually very obscure to 0.3 mm long, or apparently absent; lamina c. 0.1 mm thick, strongly concave adaxially to \pm involute, longitudinal axis slightly incurved towards apex; surfaces glabrous, \pm concolorous, adaxial surface matt, with 1–3 sunken veins evident, abaxial surface with 3–5 conspicuous, pale, flat or slightly sunken primary veins, the midrib usually more prominent than

the others; margins glabrous, hyaline. *Inflorescence* erect, terminal and upper-axillary, the very short internodes of the flowering region, together with the short unit inflorescences, combining to produce a dense head-like conflorescence; axis often markedly flexuose, 1.5–4.0 mm long with 3–11 flowers terminating in a bud-like rudiment or an attenuate point; indumentum of sparse or moderately dense hairs to *c.* 0.1 mm long; flowers erect, sessile, densely clustered along axis. *Fertile bracts* narrowly ovate to ovate, the lower ones often leaf-like and much larger than the upper, 0.9–4.8 mm long, 0.4–0.7 mm wide, acute, subacute or obtuse; abaxial surface with obscure to moderately conspicuous venation, glabrous; adaxial surface glabrous or with a few hairs basally; margins ciliolate. *Bracteoles* broadly ovate, broadly elliptic or \pm orbicular, 0.5–0.6 mm long, 0.4–0.5 mm wide, subacute to obtuse, rather obscurely keeled; abaxial surface glabrous, the central basal portion and main veins greenish-cream with darker green or reddish-purple interveinal stripes in the distal half, becoming pale and scarious towards margins; adaxial surface with a very sparse indumentum of antrorse hairs; margins ciliolate. *Sepals* ovate or elliptic, 0.8–1.2 mm long, 0.5–0.6 mm wide, subacute or obtuse, often very shortly apiculate, sometimes obscurely keeled towards apex; abaxial surface glabrous, the lower central portion and midvein greenish or greenish-cream, often flushed pink-purple distally, becoming paler and scarious towards the margins, the venation rather obscure apart from the midvein; adaxial surface with a very sparse indumentum of antrorse hairs; the margins ciliolate with hairs to *c.* 0.08 mm. *Corolla tube* white or pink, cylindrical throughout or slightly dilated in basal half and then cylindrical above, always longer than sepals (by up to 1.4 mm), 1.6–2.3 mm long, 0.6–0.8 mm wide, glabrous externally, internal surface with 5 tufts of reflexed hairs at the apex, which extend into the tube for at least 1/3 of its length, otherwise glabrous. *Corolla lobes* white or more often partially flushed pink, always shorter than the tube (ratio = 0.4–0.6: 1), widely spreading from base and \pm recurved, 0.8–1.2 mm long, 0.4–0.5 mm wide at base; glabrous externally, densely bearded internally, indumentum white, 0.45–0.55 mm long near apex; the glabrous tip < 0.1 mm long. *Anthers* \pm included within the tube, their apices held at the throat, 0.9–1.3 mm long, slightly recurved at apex; sterile tips very long and conspicuously pale towards the apices 0.6–0.8 mm long. *Filaments* terete, attached very close to apex, very short, *c.* 0.1 mm long, adnate to tube just above sinus. *Ovary* compressed ovoid, 0.6–0.8 mm long, 0.4–0.5 mm wide, with narrow median lines of very short hairs towards base, 2-locular. *Style* 0.3–0.5 mm long, very narrow cylindrical, papillose, included within the corolla tube; *stigma* distinctly expanded; *nectary* annular 0.2–0.3 mm long, usually acutely lobed for 1/2–3/4 of length, glabrous. *Fruit* shortly stipitate, slightly compressed, narrowly ellipsoid or narrowly ovate, straight or somewhat curved, 1.9–2.4 mm long (including the stipe), 0.5–0.7 mm wide, much longer than calyx, apex pale, subacute; surface smooth with two lateral ribs and two median longitudinal grooves, shortly hairy in the grooves at least in the basal half, otherwise glabrous; style deciduous. (Figure 2)

Other specimens examined. WESTERN AUSTRALIA: Kordabup Rd, [W of Denmark], 12 Sep. 1991, *A.R. Annels* 1656 (PERTH); 9.7 km WNW of Denmark. Timber Reserve 27398, 30 Aug. 1995 *A.R. Annels & R.W. Hearn* ARA 5402 (PERTH); E of western buffer, 300 m N of Scott River Rd, 31 Jan. 1997, *E. Bennett & B. Evans* SC 200.6 (PERTH); 200 m S of Mount Chudalup, 28 Oct. 1992, *M.D. Carter* 210 (PERTH); Windy Harbour, 6 Sep. 1995, *R.J. Cranfield* 10336 (PERTH); 7.4 km SSW of Stewart Rd on Milyeannup Rd [E of Augusta], 9 Oct. 2000, *R.J. Cranfield* 15550 (PERTH); 300 m along Nut Rd from junction with Ficifolia Rd, Walpole-Nornalup National Park, 10 Oct. 2003, *D.M. Crayn* 716, *K.A. Kron & A.J. Perkins* (NSW, PERTH, WFU); Cell 5, Site 165, Four Acres Rd, 2.4 km W of Tom Brittan Rd, bearing W, 20 Oct. 1998, *R. Davis* 7484 (PERTH); Scott River Rd, 0.1 km W of Milyeannup Coast Rd junction, on S side of road, Scott National Park, 22 Nov. 1989, *N. Gibson & M. Lyons* 290 (NSW, PERTH); E side of Scott River Rd, 0.3 km S of Governor Broome Rd intersection, Scott National Park, 24 Oct. 1990, *N. Gibson & M. Lyons* 1040 (PERTH); Northern boundary firebreak of Gingilup Swamps Nature Reserve, 3.5 km SE of the NW corner of the reserve, 20 Nov. 1991, *N. Gibson & M. Lyons* 1142 (PERTH); Collis Rd, 950 m N of Kangaroo Rd [N of

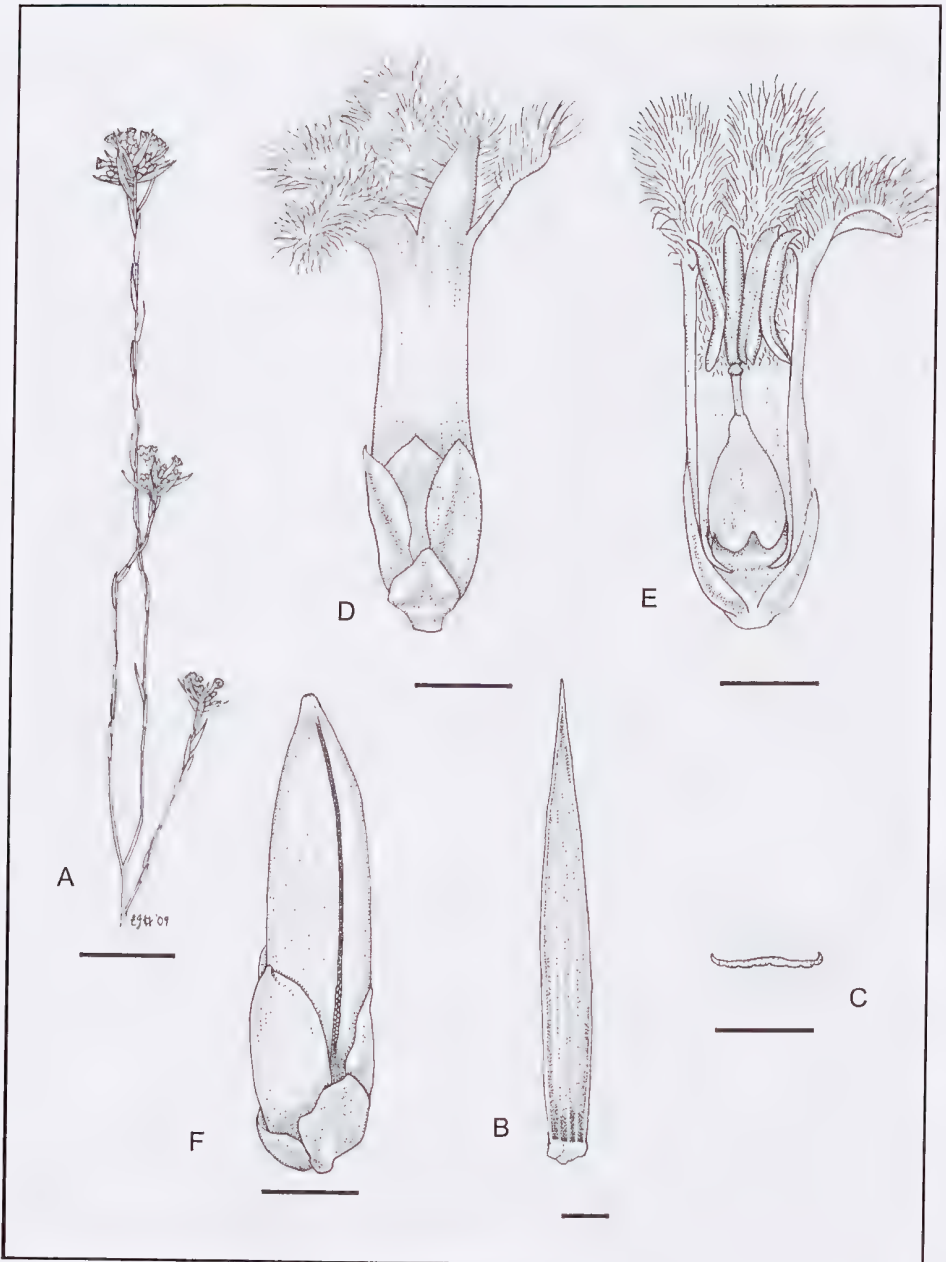


Figure 2. *Leucopogon paradoxus*. A – flowering branchlet; B – leaf, adaxial surface; C – leaf section; D – flower; E – flower, longitudinal section; F – fruit. Scale bars: A = 10 mm; B–C = 1 mm; D–F = 0.5 mm. Drawn by Ellen Hickman from R.J. Cranfield 15550 (A); M.S. Graham 851 (B–E); N. Gibson & M. Lyons 290 (F).

Walpole], 3 Oct. 1997, *M.S. Graham* MSG 851 (PERTH); S side of the South Western Highway, along a powerline right-of-way, c. 0.95 km W of junction with Coalmine Beach Rd, less than 1 km E of Walpole town limits, 8 Oct. 1999, *J.W. Horn* 2797 (CANB, DUKE, PERTH); Site 99, 8 km ENE of Augusta, 26 Aug. 1997, *P.A. Jurjevich* 660 (PERTH); Chester Block, Dennis Rd, Scott River, 26 Dec. 1990, *G.J. Keighery* s.n. (PERTH); Bell Brook Swamp, D'Entrecasteaux National Park, 6 Oct. 1997, *E.D. Middleton* EDM 54 (PERTH); Boatlanding Rd, [W of Pemberton], 12 Oct. 1985, *E. & S. Pignatti* 776 (PERTH); Scott National [Park], SECWA line to river, 24 Sep. 1990, *C.J. Robinson* 192 (PERTH); 1 km S of Forest Grove Rd [S of Witchcliffe], along National Park boundary track 13 Dec. 2000, *J. Scott* 358 (PERTH); Walpole-Nornalup National Park, Nut Rd, c. 0.8 km N of Ficifolia Rd, 16 Oct. 1991, *J.R. Wheeler* 2793 (PERTH).

Distribution and habitat. Occurs between Witchcliffe, Augusta and the Denmark area (Figure 3) within 30–40 km of the coast. The species is restricted to low-lying, winter-wet sites in heath or open woodland communities, often in association with *Astartea* spp., *Taxandria* spp., *Beaufortia sparsa*, *Homalospermum firmum*, and various sedges and restiads.

Phenology. Flowers over an extended period between August and January, peaking between September and November. Fruit is usually present on herbarium specimens collected from October onwards.

Etymology. The epithet is from the Greek *paradoxos* (strange, contrary to expectation), a reference to some anomalous features of the floral morphology of this species, as discussed under the notes section below.

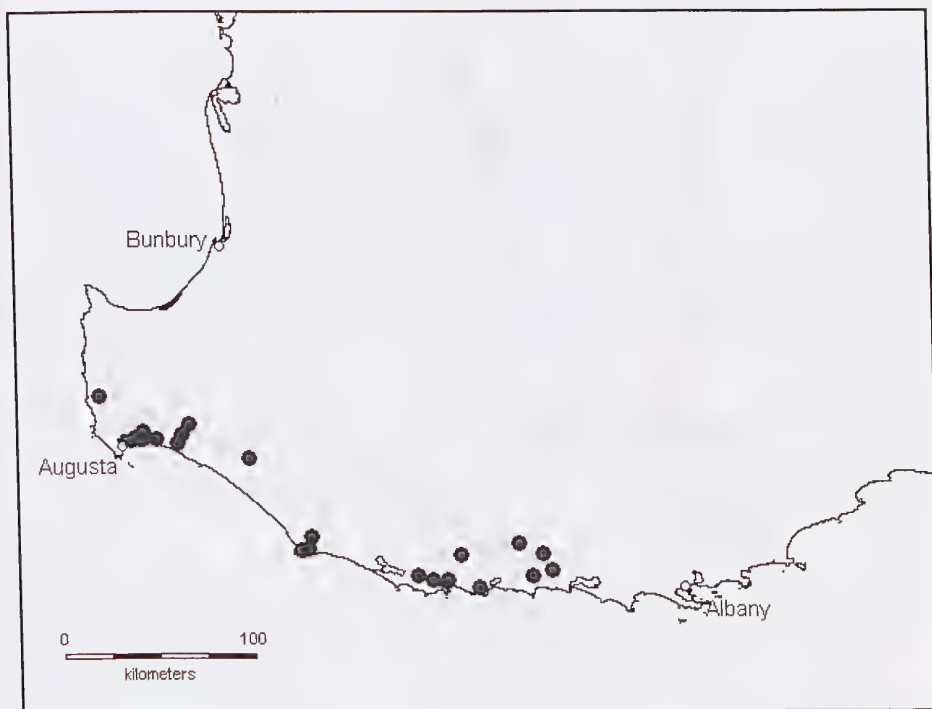


Figure 3. Distribution of *Leucopogon paradoxus* in south-west Western Australia.

Conservation status. *Leucopogon paradoxus* has a fairly wide regional distribution in near coastal parts of the far south-west and is well conserved in several National Parks and Nature Reserves where it is apparently locally common in suitable habitat. However it is restricted to one of the wettest districts of southern Western Australia and may become vulnerable in the medium term to the warming and drying effects of predicted climate change. Additionally its susceptibility to the fast-spreading root-rot pathogen *Phytophthora cinnamomi* Rands., has not been established, and many epacrids are known to be vulnerable (Keighery 1996). Although no conservation coding is recommended here, its status should be re-examined at intervals.

Affinities. Although a distinctive species in the detail of its floral and inflorescence morphology, it has been confused with two other slender, swamp-loving species – *Leucopogon tenuicaulis* J.M.Powell ex Hislop (described below) and especially *L. gilbertii* Stschegl. From the former *L. paradoxus* differs in its attenuate or cuneate leaf bases (usually cordate or rounded, rarely cuneate in *L. tenuicaulis*), sessile flowers (pedicellate), shorter corolla lobes, 0.8–1.2 (1.4–2.0), with a lower corolla lobe to corolla tube ratio, 0.4–0.6 : 1 (0.8–1.2: 1), and in having a longer, narrower style which is deciduous in fruit.

Leucopogon gilbertii shares the narrow, concave leaves and dense, head-like conflorescences of *L. paradoxus* but the two can be readily distinguished by differences in their corolla – *L. paradoxus* having a long, conspicuous corolla tube, always much longer than the sepals, whereas *L. gilbertii* has the tube about the same length as the sepals or shorter. The two have been observed by the author growing sympatrically on the Scott River Plains together with *L. wheelerae* Hislop. The sepal and fruit characters of *L. gilbertii* are interesting. The brown-coloured, narrowly obovate or elliptic sepals are quite unlike those of any other western member of the genus. Additionally the tiny, thin-walled, compressed-obovoid fruit is highly distinctive and does not suggest a particularly close relationship with any of the species groups delineated by Hislop & Chapman (2007).

Notes. Although common in *Leucopogon s. lat.*, the very long corolla tube, relative to the corolla lobes and sepals, is highly unusual in *Leucopogon s. str.* Among western species such an elongated tube is only otherwise seen in *L. verticillatus* R.Br. Even within Group E *L. paradoxus* is atypical in that it has a very slender, well defined style which is shed before the fruit matures. By contrast the other species have short, thick persistent styles, which are wholly or partially obscured by a fleshy appendage at maturity. In addition all members of the group except *L. paradoxus* have longitudinal bands of hair which extend into the corolla tube to a point more or less level with the base of the anthers. In *L. paradoxus*, although its hairy throat looks superficially similar, it actually has a narrow apical ring of hairs which are reflexed into the tube.

Leucopogon tenuicaulis* J.M.Powell ex Hislop, *sp. nov.

Leucopogi gracili affinis sed foliis maioribus sparsius distributis, basibus rotundatis vel cordatis non cuneatis, et floribus pedicellatis differt.

Typus: Milyeannup Coast Rd at Stewart Rd turnoff [SW of Nannup], Western Australia, 21 October 1993, A.S. George 17124 (*holo:* PERTH 04616065; *iso:* CANB, NSW).

Leucopogon tenuicaulis J.M. Powell ms, in G. Paczkowska & A.R. Chapman, *West. Austral. Fl.: Descr. Cat.* p. 241 (2000); in J. Wheeler, N. Marchant, & M. Lewington, *Fl. South West* 2: 599 (2002).

Erect or \pm sprawling, rather delicate *shrubs* to 50 cm and 50 cm wide, single-stemmed at ground level with a fire-sensitive rootstock. Young *branchlets* very slender, reddish-brown or yellowish-brown, glabrous, overlain on older stems with grey fissured bark which often exfoliates in strips. *Leaves* spirally arranged, steeply antrorse or antrorse-appressed, often \pm stem-clasping at base, usually narrowly ovate or narrowly elliptic, occasionally narrowly obovate, 5–22 mm long, 1.7–5.2 mm wide; apex acute with a short, straight, pale, callus tip; base rounded or cordate, occasionally cuneate; petiole well defined, brown or reddish-brown, 0.4–1.1 mm long, glabrous; lamina 0.15–0.25 mm thick, strongly concave adaxially to \pm involute; surfaces \pm concolorous, adaxial surface matt, glabrous, venation not evident, abaxial surface glabrous, with 5–7 usually rather indistinct, flat, slightly raised or slightly sunken primary veins, the midrib no more prominent than the others; margins entire or \pm crenulate, glabrous throughout or coarsely ciliolate with antrorse hairs especially towards apex. *Inflorescence* erect, terminal and upper-axillary; axis 5–19 mm long, with 11–28 flowers, terminating in a bud-like rudiment; indumentum of sparse to moderately dense patent hairs to *c.* 0.08 mm long; flowers erect, rather densely clustered along axis, pedicellate below the bracteoles for up to 1.4 mm and sometimes also above the bracteoles for up to 0.4 mm. *Fertile bracts* ovate, 0.8–1.3 mm long, 0.5–0.7 mm wide, obtuse to subacute; abaxial surface with moderately conspicuous venation, glabrous; adaxial surface with appressed hairs; margins minutely ciliolate. *Bracteoles* ovate, 0.6–1.1 mm long, 0.5–0.7 mm wide, acute, keeled; abaxial surface glabrous, the veins pale greenish-cream with reddish-purple interveinal stripes or the entire central portion greenish-cream which may or may not be suffused purple, becoming paler and scarious towards the margins; adaxial surface with very short antrorse hairs; margins ciliolate. *Sepals* ovate or narrowly ovate, 1.2–2.1 mm long, 0.6–1.0 mm wide, obtuse, subacute or occasionally acute; abaxial surface glabrous, the lower central portion uniformly greenish-cream, the venation usually conspicuous in distal half, greenish-cream with darker green or reddish-purple interveinal stripes, becoming paler and scarious towards the margins; the adaxial surface with short antrorse hairs; margins ciliolate with hairs to *c.* 0.1 mm long. *Corolla tube* white or pale pink, narrowly campanulate or \pm cylindrical, always longer than the sepals (by up to 1.1 mm), 1.3–2.0 mm long, 0.9–1.1 mm wide, glabrous externally, internal surface with 5 longitudinal bands of hair extending from the base of the lobes to a point \pm level with the anther bases. *Corolla lobes* white or partially suffused pink, slightly longer than to distinctly shorter than the tube (ratio = 0.8–1.2: 1), widely spreading from the base and recurved, 1.4–2.0 mm long, 0.5–0.7 mm wide at base; glabrous externally, densely bearded internally, indumentum white, 0.5–0.8 mm long near apex; the glabrous tip 0.1–0.2 mm long. *Anthers* partially exerted from tube (by 1/8–1/4 of length), 1.2–1.8 mm long, prominently recurved at apex; sterile tips 0.5–0.8 mm long with conspicuous white apices; *filaments* terete, attached 3/4–7/8 above anther base, very short 0.1–0.2 mm long, adnate to tube just below sinus. *Ovary* slightly compressed, ovoid, 0.4–0.5 mm long, 0.3–0.4 mm wide, with moderately dense antrorse hairs in basal half, *c.* 0.2 mm long, 2-locular. *Style* 0.2–0.3 mm long, thick, papillose, included within corolla tube; *stigma* slightly to distinctly expanded; *nectary* annular, 0.3–0.5 mm long, enveloping the lower 2/3–3/4 of the ovary, irregularly and usually acutely lobed for up to 1/2 of length, glabrous apart from a sparsely and irregularly ciliolate rim. *Fruit* stipitate, compressed, ovoid, straight or slightly curved, 1.8–2.1 mm long (including the stipe), 0.8–1.0 mm wide, longer than the calyx, the apex a fleshy rim produced vertically so as to obscure the style usually leaving only the stigma exposed at maturity; sparsely hairy in lower half, surface smooth with a shallow, median, longitudinal groove; style persistent. (Figure 4)

Other specimens examined. WESTERNAUSTRALIA: 900 m S of Brennans Ford on Scott River Rd then about 2.4 km W on track, then 20 m in from N side of track [NE of Augusta], 17 Dec. 1996, *A. Annels & C. Godden* SC 109.14 (PERTH); 2 km S along Scott River Rd from intersection with Brockman Highway [NE of Augusta], 10 Oct. 1997, *E.A. Brown* 97/264 & *G. Taaffe* (NSW, NY, PERTH, UNSW); Scott River – Flinders Bay district, 27 Dec. 1957, *D.M. Churchill s.n.* (PERTH 02355027); 5.2 km

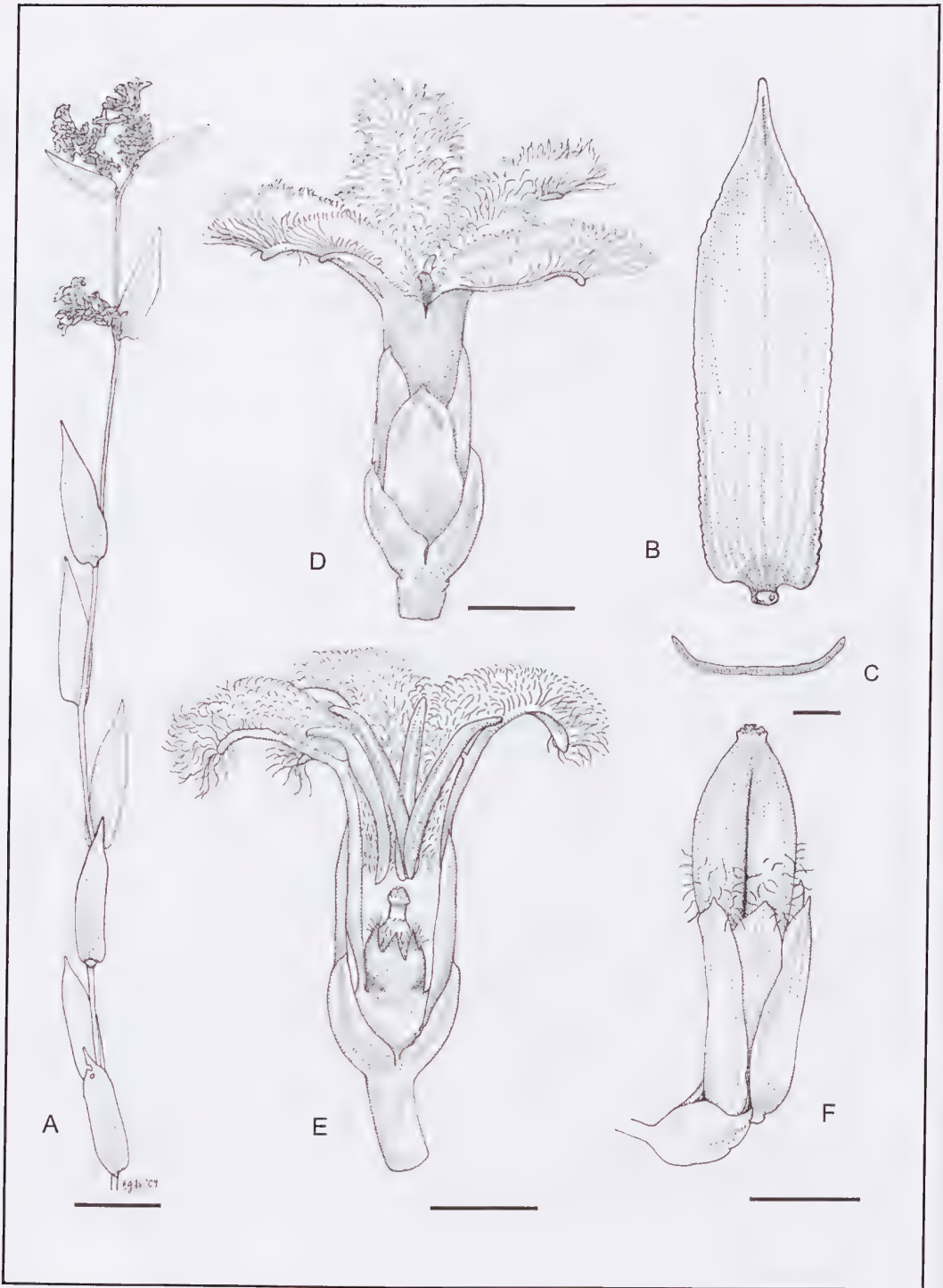


Figure 4. *Leucopogon tenuicaulis*. A – flowering branchlet; B – leaf, adaxial surface; C – leaf section; D – flower; E – flower, longitudinal section; F – fruit. Scale bars: A = 10 mm; B–F = 1 mm. Drawn by Ellen Hickman from A.S. George 17124.

ESE of Alexandra Bridge [NE of Augusta], 19 Sep. 1995, *R. Davis* 148 (CANB, PERTH); Blackwood River, *s.d.*, *J. Forrest s.n.* (MEL, PERTH); W side of Scott River Rd, 0.4 km S of Governor Broome Rd intersection, Scott River National Park, 24 Oct. 1990, *N. Gibson & M. Lyons* 1046 (PERTH); Site 99, 8 km ENE of Augusta, 26 Aug. 1997, *P.A. Jurjevich* 661 (PERTH); Williamson Rd, Willcox Block, Whicher Range, 28 July 1990, *G.J. Keighery* 11718 (PERTH); 3.1 km E of the Milyeannup Coast Rd and Stewart Rd intersection on S side of Stewart Rd [SW of Nannup], 19 Sep. 1995, *C. McChesney* CM 79 (PERTH); 3 km W of Brockman Highway & Milyeannup Coast Rd intersection on S side of Brockman Highway [W of Nannup], 4 Oct. 1995, *C. McChesney* CM 129 (PERTH); Quilergup [NW of Nannup], 2 Aug. 1972, *G.S. McCutcheon* GSM 392 (PERTH); Scott River Rd, 2.1 km from Brockman Highway [NE of Augusta], 24 Aug. 1986, *J.M. Powell* 2618 (NSW, PERTH); 2.7 km S from Brockman Highway on Scott River Rd [NE of Augusta], 9 Nov. 1985, *J.M. Powell* 3058 (HO, K, NSW, PERTH); 400 m S of McAtee Rd on Stoate Rd, then c. 300 m E to open heath, Helms Forest Block, NW of Nannup, 15 Aug. 2000, *L.W. Sage* 2370 (PERTH) Scott River National Park, along road to east Augusta, 4 Aug. 2007, *K.R. Thiele* 3306 (PERTH).

Distribution and habitat. The main centre of distribution for this species is on the Scott River flats to the north-east and east of Augusta, with a few populations known from further north, in the valleys of the Whicher Range (Figure 5). It is restricted to low-lying, winter-wet areas in heath or open woodland. Associated species include *Kunzea* spp., *Beaufortia sparsa*, *Pericalymma ellipticum* and numerous sedges and restiads.

Phenology. The main flowering period is between August and December, with fruit commonly present from October onwards.

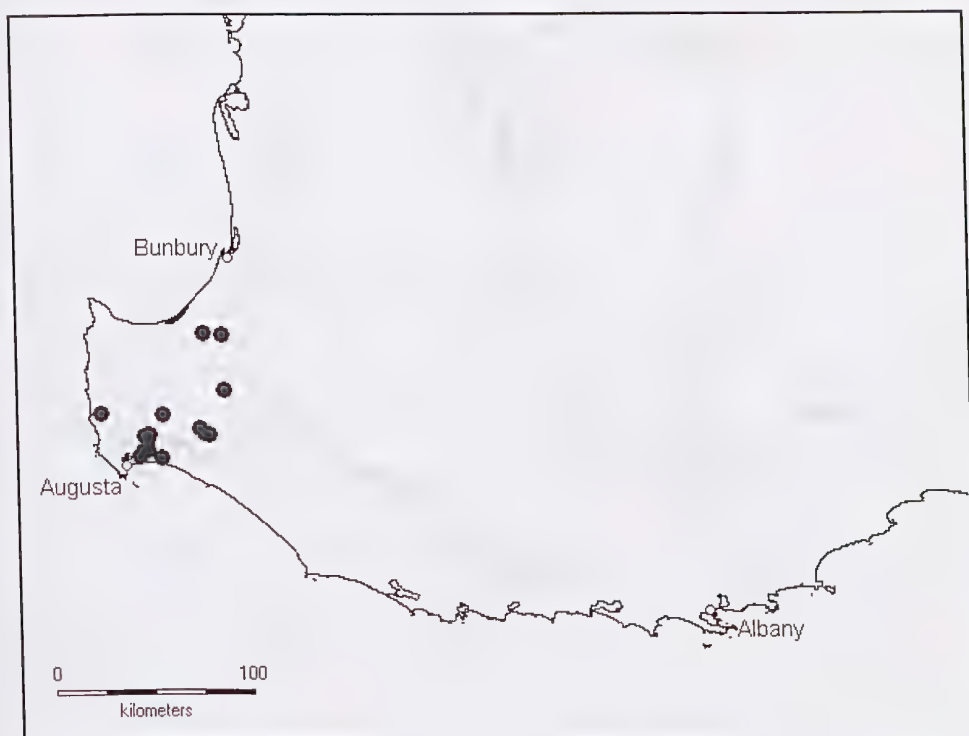


Figure 5. Distribution of *Leucopogon tenuicaulis* in south-west Western Australia

Etymology. The specific epithet is derived from the Latin (*tenus* – narrow, delicate, and *caulis* – stem) and refers to the very fine branchlets that are a characteristic of the species.

Conservation status. Populations of this species are conserved in the Scott River National Park and the proposed Milyeannup National Park. As with *Leucopogon paradoxus* however, *L. tenuicaulis* is restricted to one of the wettest parts of south-western Australia, and although locally common it seems likely that it will be adversely affected by predicted climate change. This species is also known to be vulnerable to the root-rot pathogen *Phytophthora cinnamomi* Rands. The collection *L.W. Sage* 2370 represents a voucher specimen from an infected population, made during survey work by the Department of the Environment and Conservation's Dieback Hygiene & Mapping Service.

Affinities. Within the *Leucopogon gracilis* species group, *L. tenuicaulis* is most likely to be confused with *L. paradoxus* and *L. gracilis*. From the latter it is most easily separated by its generally larger, more sparsely distributed leaves, which have bases either rounded or cordate (on all or at least some leaves), rather than cuneate, and by the distinctly pedicellate flowers, especially those in the basal half of the inflorescence. Refer to the affinities section under *L. paradoxus* for differences between *L. tenuicaulis* and that species.

Acknowledgements

I would like to thank the following people for their help in putting this paper together: Sarah Barrett for her collections and observations of *Leucopogon oppositifolius* and *L. lasiophyllus* in the Stirling Range, Skye Coffey and Sue Carroll for technical assistance, Ellen Hickman for the excellent illustrations, Juliet Wege for nomenclatural advice and producing the distribution maps and Paul Wilson for providing the Latin diagnoses.

References

- Bentham, G. (1868). *Flora Australiensis* Vol. 4. (Reeve: London.)
- Blackall, W.E. & Grieve, B.J. (1981). *How to know Western Australian wildflowers*. Part IIIB. (University of Western Australia Press: Nedlands, WA.)
- Brown, R. (1810). *Prodromus florum Novae Hollandiae* Vol. 1. (Johnson: London.)
- Hislop, M. & Chapman, A.R. (2007). Three new and geographically restricted species of *Leucopogon* (Ericaceae: Styphelioideae: Styphelieae) from south-west Western Australia. *Nuytsia* 17: 165–184.
- Hislop, M. (2009). The taxonomy of *Leucopogon bossiaea* and allied species (Ericaceae: Styphelioideae: Styphelieae) from the central south coast of Western Australia. *Nuytsia* 19: 17–35.
- Keighery, G.J. (1996). Phyto geography, biology and conservation of Western Australian Epacridaceae. *Annals of Botany* 77: 347–355.
- Powell, J.M., Morrison, D.A., Gadek, P.A. & Quinn, C.J. (1997). Relationships and generic concepts within Styphelieae (Epacridaceae). *Australian Systematic Botany* 10: 15–29.
- Sonder, O.G. (1845). Epacridae. In: Lehmann, C. (ed.) *Plantae Preissianae*. Vol.1. (Meissner: Hamburg.)
- Stschegleew, S.S. (1859). Descriptio Epacridearum novarum. *Bulletin de la Société Impériale des Naturalistes de Moscou* 32(1): 14–16.
- Wheeler, J., Marchant, N. & Lewington, M. (2002). *Flora of the south west: Bunbury–Augusta–Denmark*. Vol. 2: Dicotyledons. (Australian Biological Resources Study: Canberra.)